

WHAT IS CLAIMED IS:

1. A speech processing system, comprising:
an acoustic model;
a composite language model including a rules-based model portion and a statistical model portion; and
a decoder coupled to the acoustic model and the composite language model and configured to map portions of a natural language speech input to pre-terminals and slots, derived from a schema, based on the acoustic model and the composite language model.
2. The speech processing system of claim 1 wherein the decoder is configured to map portions of the natural language speech input to the slots based on the rules-based model portion of the composite language model.
3. The speech processing system of claim 1 wherein the decoder is configured to map portions of the natural language speech input to the pre-terminals based on the statistical model portion of the composite language model.
4. The speech processing system of claim 1 wherein the statistical model portion of the composite language model comprises:

a plurality of statistical n-gram models, one statistical n-gram model corresponding to each pre-terminal.

5. The speech processing system of claim 4 wherein the composite language model supports a vocabulary of words and wherein the statistical n-gram models are trained based on training data, and wherein words in the vocabulary that are not used to train a specific statistical n-gram model comprise unseen words for the specific statistical n-gram model.

6. The speech processing system of claim 5 wherein the statistical model portion of the composite language model further comprises:

a backoff model portion which, when accessed, is configured to assign a backoff score to a word in the vocabulary.

7. The speech processing system of claim 6 wherein each statistical n-gram model includes a reference to the backoff model portion for all unseen words.

8. The speech processing system of claim 7 wherein the backoff model portion comprises:

a uniform distribution n-gram that assigns a uniform score to every word in the vocabulary.

9. The speech processing system of claim 1 wherein the rules-based model portion comprises:

a context free grammar (CFG).

10. A method of assigning probabilities to word hypotheses during speech processing, comprising:

receiving a word hypothesis;

accessing a composite language model having a plurality of statistical models and a plurality of rules-based models;

assigning an n-gram probability, with an n-gram model, to the word hypothesis if the word hypothesis corresponds to a word seen during training of the n-gram model; and

referring to a separate backoff model for the word hypothesis if the word hypothesis corresponds to a word unseen during training of the n-gram model; and

assigning a backoff probability to each word hypothesis, that corresponds to an unseen word, with the backoff model.

11. The method of claim 10 and further comprising:

mapping the word hypotheses to slots derived from an input schema based on the rules-based models in the composite language model.

12. The method of claim 11 and further comprising:

mapping the word hypotheses to pre-terminals derived from the input schema based on probabilities assigned by the n-gram models and the backoff model in the composite language model.

13. The method of claim 12 wherein referring to a separate backoff model comprises:

referring to a uniform distribution n-gram.

14. The method of claim 13 wherein assigning a backoff probability comprises:

assigning a uniform distribution score to every word in the vocabulary.

15. A composite language model for use in a speech recognition system, comprising:

a rules-based model portion accessed to map portions of an input speech signal to slots derived from a schema; and

a statistical model portion accessed to map portions of the input speech signal to pre-terminals derived from the schema.

16. The composite language model of claim 15 wherein the statistical model portion comprises:

a plurality of statistical n-gram models, one statistical n-gram model corresponding to each pre-terminal.

17. The composite language model of claim 15 wherein the rules-based model portion comprises:

a context free grammar (CFG).

18. The composite language model of claim 16 wherein the composite language model supports a vocabulary of words and wherein the statistical n-gram models are trained based on training data, and wherein words in the vocabulary that are not used to train a specific statistical n-gram model comprise unseen words for the specific statistical n-gram model.

19. The composite language model of claim 18 wherein the statistical model portion of the composite language model further comprises:

a backoff model portion which, when accessed, is configured to assign a backoff score to a word in the vocabulary.

20. The composite language model of claim 19 wherein each statistical n-gram model includes a reference to the backoff model portion for all unseen words.

21. The composite language model of claim 20 wherein the backoff model portion comprises:

a uniform distribution n-gram that assigns a uniform score to every word in the vocabulary.